

REMARKS

By the present amendment, claims 13-14, 17-19, 24, 29 and 32 have been amended to obviate the examiner's objections thereto and/or to further clarify the concepts of the present invention. Among other things, claims 17-19, 24 and 32 have been amended to be in independent form and to include all of the limitations of the base claim and any intervening claims. Entry of these amendments is respectfully requested.

Initially, applicants acknowledge with appreciation the indication contained in the Office Action of October 30, 2002, that claims 17-19, 24-28 and 32-33 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. As mentioned above, claims 17-19, 24 and 32 have been amended herein to be in independent form and to include all of the limitations of the base claim and any intervening claims. Thus, it is submitted that these claims are in condition for immediate allowance.

In the previously mentioned Office Action, claim 13 was rejected under the second paragraph of 35 USC § 112 as being indefinite, it being alleged that this claim was confusing in terms of the relationship between the dissolution unit and the preparation tank as defined by claim 14.

Regarding the relationship between the preparation tank and the dissolution unit,

it is submitted that the preparation tank 21 is part of the dissolution unit 22. Among others, support may be found in the following:

(i) As is evident from Fig. 2, reference numeral 21 with a lead line indicates a specific element while reference numeral 22 with lead line with an arrow point generally indicates a collection of elements. Therefore, it is to be understood from this drawing figure that the dissolution unit 22 includes the preparation tank 21.

(ii) The description starting from the bottom of page 5 to page 6, line 8 states that a liquid and a gas are supplied to the dissolution unit and the dissolution unit 22 prepares a chemical solution by dissolving the gas in the liquid. Further, the description at page 6, lines 18-19, states that undissolved gas is discharged from the preparation tank 22. Based on this description, it is to be understood that the dissolution unit 22 includes the preparation tank 21.

Furthermore, it is submitted that the subject claims as amended distinguish over the art cited in the above-mentioned Office Action. More particularly, the independent claim 13 was rejected under 35 USC § 102(b) as being anticipated by any one of the Nakajima, Nelson, Nurmi, or Ginburgh patents.

It is submitted that claim 13 as amended and the claims dependent thereon as amended distinguish over the cited patents. More particularly, the apparatus now defined by amended claim 13 includes a controller (31, 92) for simultaneously operating the

dissolution unit and at least one of the gas discharge control unit and the liquid discharge control unit.

With the recited controller, dissolution of a chemical gas in a liquid and refinement of the resultant chemical solution are performed simultaneously. Impurities contained in the liquid and the chemical gas are discharged with a small amount of the chemical solution from the bottom of the preparation tank 21 and impurities contained in the chemical gas are discharged with small amount of the chemical gas from the upper portion of the preparation tank 21 while preparing the chemical solution. As a result, a relatively high purity chemical solution is obtained within a short period of time. Among other things, none of the cited patents disclose a controller as presently claimed.

Also in the subject Action, independent claim 29 was rejected under 35 USC § 103(a) as being unpatentable over the patent to Nelson. It is submitted that claim 29 as amended and the claims dependent thereon as amended distinguish over the cited Nelson patent.

More particularly, the apparatus as defined by claim 29 includes a dissolution unit for dissolving the chemical gas in the liquid to prepare a chemical solution and cool the chemical solution during the preparation, a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid by the dissolution unit, and a controller for simultaneously operating the dissolution unit and the gas

discharge control unit. That is, in this apparatus, the chemical solution is prepared by simultaneously operations of dissolving a gas to liquid, cooling the chemical solution, and discharging an adjusted amount of the gas. With an apparatus as recited by claim 29, a chemical solution having a reduced impurity concentration can be obtained even when an

industrial chemical grade gas, which contains impurities at a relatively high concentration,

is used. Such a result is not be achieved by the apparatus according to the cited patent.

↙
not an issue
recited in claim 29

The Nelson patent is provides a system for increasing the quantity of dissolved gas in a liquid. That is, the Nelson patent relates a system for producing a solution having high concentration. Therefore, the Nelson patent does not teach decreasing impurity concentration of a chemical solution. Further, the Nelson patent states on column 2, lines 59-63 that there is a need to minimize the amount of ozone used. Therefore, the concept of this patent is quite different from that of the present invention.

Further, the Nelson patent cites USP 5,464,480 which apparently teaches that high ozone concentration water may be obtained by mixing ozone and water at a temperature of from about 1 to 15°C. Although the '480 patent teaches to increase the quantity of dissolved ozone, the patent does not teach reducing impurity concentration of a solution.

Consequently, since neither the Nelson patent nor the '480 patent teaches reducing impurity concentration of a chemical solution, it is not possible to achieve the above described advantage of the present invention by the combination of the Nelson and '480

patent.

In view of the foregoing detailed discussion and the amendments herein, it is submitted that the subject application is now in condition for allowance and early notice to that effect is earnestly solicited.

In the event this paper is not timely filed, the undersigned hereby petitions for an appropriate extension of time. The fee for this extension may be charged to Deposit Account No. 01-2340, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

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Marked Up Version of Amendments to Specification and Claims

IN THE CLAIMS:

Please amend claims 13-14, 17-19, 24, 29 and 32 as follows:

13. (Twice Amended) A chemical solution preparation apparatus comprising:
a gas supply line for supplying a chemical gas;
a liquid supply line for supplying a liquid, which is one of pure water or a mixture having a predetermined composition;
a dissolution unit for dissolving the chemical gas in the liquid; and
at least either one of a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid ~~by the dissolution unit and~~
a liquid discharge control unit for discharging a predetermined amount of the chemical solution ~~from the dissolution unit~~ , which is prepared by dissolving; and
a controller for simultaneously operating the dissolution unit and at least , wherein
one of the gas discharge control unit and the liquid discharge control unit is operated at
substantially the same time as the dissolution unit.

14. (Twice Amended) The preparation apparatus according to claim 13, further comprising wherein the dissolution unit includes a preparation tank for receiving the liquid from the liquid supply line in which the chemical solution is prepared, and wherein the dissolution unit includes a gas supply unit for forming bubbles of the chemical gas in the preparation tank to dissolve the chemical gas in the liquid.

17. (Amended) ~~The preparation apparatus according to claim 16~~ A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas;

a liquid supply line for supplying a liquid, which is one of pure water or a mixture having a predetermined composition;

a dissolution unit for dissolving the chemical gas in the liquid, wherein the dissolution unit includes a preparation tank in which the chemical solution is prepared and a gas supply unit for forming bubbles of the chemical gas in the preparation tank to dissolve the chemical gas in the liquid; and

at least either one of a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid and a liquid discharge control unit for discharging a predetermined amount of the chemical solution, wherein one of the gas discharge control unit and the liquid discharge control unit is operated at substantially the same time as the dissolution unit;

a cooling unit for cooling the liquid in the preparation tank], wherein the cooling unit includes a pump for circulating the chemical solution between the preparation tank and a second pipe and a cooling element connected to the second pipe.

18. (Amended) ~~The preparation apparatus according to claim 16~~ A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas;

a liquid supply line for supplying a liquid, which is one of pure water or a mixture

having a predetermined composition;

a dissolution unit for dissolving the chemical gas to the liquid, wherein the dissolution unit includes a preparation tank in which the chemical solution is prepared and a gas supply unit for forming bubbles of the chemical gas in the preparation tank to dissolve the chemical gas in the liquid; and

at least either one of a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid and a liquid discharge control unit for discharging a predetermined amount of the chemical solution, wherein one of the gas discharge control unit and the liquid discharge control unit is operated at substantially the same time as the dissolution unit;

a cooling unit for cooling the liquid in the preparation tank , wherein the cooling unit includes a cooling element connected to the preparation tank and a pump for circulating the chemical solution between the preparation tank and the cooling element.

19. (Amended) ~~The preparation apparatus according to claim 16, further comprising~~ A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas;

a liquid supply line for supplying a liquid, which is one of pure water or a mixture having a predetermined composition;

a dissolution unit for dissolving the chemical gas in the liquid, wherein the dissolution unit includes a preparation tank in which the chemical solution is prepared and a gas supply unit for forming bubbles of the chemical gas in the preparation tank to dissolve the

chemical gas in the liquid; and

at least either one of a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid and a liquid discharge control unit for discharging a predetermined amount of the chemical solution, wherein one of the gas discharge control unit and the liquid discharge control unit is operated at substantially the same time as the dissolution unit;

a cooling unit for cooling the liquid in the preparation tank; and

a gas cylinder containing liquefied chemical gas, wherein the cooling unit includes a heat exchanger for exchanging heat between the gas cylinder and the preparation tank.

24. (Twice Amended) ~~The preparation apparatus according to claim 23~~ A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas;

a liquid supply line for supplying a liquid, which is one of pure water or a mixture having a predetermined composition;

a dissolution unit for dissolving the chemical gas in the liquid; and

at least either one of a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid and a liquid discharge control unit for discharging the predetermined amount of the chemical solution, which is prepared by dissolving, wherein one of the gas discharge control unit and the liquid discharge control unit is operated at substantially the same time as the dissolution unit;

a concentration measuring device for measuring the concentration of the chemical

solution, wherein the concentration measuring device includes at least one of the viscosity meter, a specific gravity meter, an ultrasonic wave velocity meter, and a specific conductance meter ; and

a concentration adjusting device for adjusting the concentration of the chemical solution in accordance with the measured result of the concentration measuring device, ~~and~~ wherein the concentration adjusting device includes a controller for calculating the concentration of the chemical solution from the measured result of the concentration measuring device and controlling the amount of the chemical gas supplied to the dissolution unit from the gas supply line in accordance with the calculated concentration.

29. (Twice Amended) A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas;

a liquid supply line for supplying a liquid;

a dissolution unit for dissolving the chemical gas in the liquid to prepare a chemical solution and cooling the chemical solution during the preparation; and

a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the dissolution unit; and

a controller for simultaneously operating the dissolution unit and at least one of the gas discharge control unit and the liquid discharge control unit.

32. (Amended) ~~The preparation apparatus according to claim 29, further comprising~~ A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas;

a liquid supply line for supplying a liquid;

a dissolution unit for dissolving the chemical gas in the liquid to prepare a chemical solution and cooling the chemical solution during the preparation; and

a gas collection unit connected to the dissolution unit and a facility for fabricating electronic devices, wherein the gas collection unit collects chemical gas from used chemical solution disposed of by the fabrication facility, and supplies the collected chemical gas to the dissolution unit.